Catalogue of American Amphibians and Reptiles.

McCoy, C.J., and R.C. Vogt. 1994. *Graptemys*.

Graptemys Agassiz
Map Turtles

Graptemys Agassiz, 1857:436. Type-species, *Graptemys geographica* (Le Sueur, 1817) [= *Testudo geographica* Le Sueur, 1817:86], subsequent designation by Brown, 1908:114 (Bour and Dubois, 1983:42).
Malacoclemmys: Cope, 1875:53 (part).
Malaclemys: McDowell, 1964:274.

• **Content.** Twelve species are recognized: *Graptemys barbouri*, *G. ernsti*, *G. gibbonsi*, *G. pulchra* (*pulchra* group); *G. geographica* (*geographica* group); *G. caglei*, *G. ouachitensis*, *G. pseudogeographica*, *G. versa* (*pseudogeographica* group); *G. flavimaculata*, *G. nigrinoda*, *G. oculifera* (*oculifera* group).

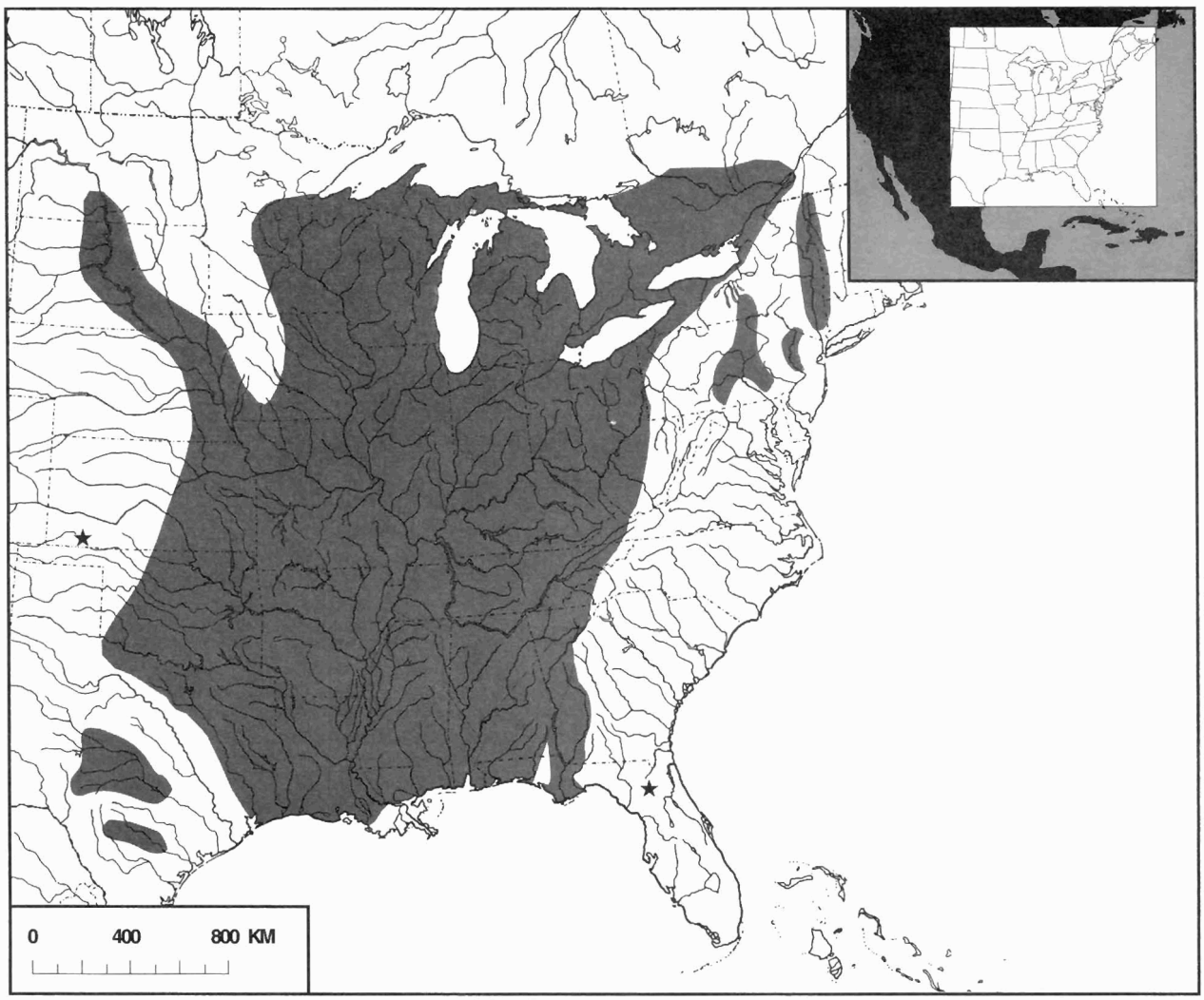
• **Definition.** Turtles in the genus *Graptemys* are mall to large aquatic emydine turtles, maximum adult size ranging from 15 cm carapace length (male *G. nigrinoda*) to 32 cm (female *G. barbouri*). Adult females are larger than males, and sexual dimorphism in size is extreme (maximum SDI 2.58, in *G. pulchra*; Gibbons and Lovich, 1990). Adult females of some species have grotesquely enlarged heads and massive jaws. The carapace outline is oval to "teardrop shaped" and usually elevated in profile. Vertebral spines, present in most species, vary from extreme knob-like or blade-shaped projections to a slightly serrate, elevated vertebral profile. Vertebral spines are more prominent in juveniles and males. The posterior edge of the carapace is strongly serrate, and the carapacial scutes are smooth. The neural bones are hexagonal and short-sided anteriorly. The plastron is large, solid (not hinged), and has large bridges with weak buttresses. The entoplastron lies anterior to the humero-pectoral seam.

The ground color of the carapace is a shade of green or greenish brown with a pattern of lighter (light green, yellow, or orange) and sometimes darker (brown or black) circles, spots, or lines. The pattern frequently consists of a light reticulum of interconnecting lines on a darker background, hence the common name "map turtles," in allusion to the map-like pattern. The plastron is light yellow or tan with a dark pattern of either concentric rings or lines along the scute seams. The ground color of head, legs, and tail is dark green to black with a multilineate pattern of lighter color (green or yellow). The head pattern consists of a combination of spots or blotches above, behind, and below the orbits, with a series of temporal lines extending onto the neck. Each species, although variable, has a modal head pattern that is species-specific and which may function in species recognition during courtship (Vogt, 1993).

The toes are fully webbed, and the hind feet are much enlarged for swimming. Each foot has five claws, and the foreclaws in adult males of some species are elongate.

The skull usually is narrow to moderately broad in males and broader in females. The temporal arch is complete and the orbitonasal foramen is enlarged. The crushing surfaces of the jaws are not ridged, and are greatly broadened in adult females of some species. The anterior border of the inferior process of the parietal is thickened, and the pterygoid touches the exoccipital.

The karyotype is either 2n = 50 or 2n = 52 (Bickham and Carr, 1983).



Map. Present range of the genus *Graptemys*. The stars mark extralimital fossil localities; see species accounts for other fossil records.

• **Descriptions and Illustrations.** References to external features are listed in the species accounts, and only selected references to descriptions or illustrations follow: general descriptions with illustrations (Carr, 1952; Ernst and Barbour, 1972, 1989; Vogt, 1981; Conant and Collins, 1991); illustrated descriptions of species, *G. barbouri* (Carr and Marchand, 1942; Cagle, 1952); *G. caglei* (Haynes and McKown, 1974); *G. ernsti* (Mount, 1975; Shealey, 1976; Lovich and McCoy, 1992); *G. flavimaculata* (Cagle, 1954); *G. geographica* (Cahn, 1937; Carr, 1952; Vogt, 1981); *G. gibbonsi* (Dundee and Rossman, 1989; Lovich and McCoy, 1992); *G. nigrinoda* (Cagle, 1954; Folkerts and Mount, 1969; Mount, 1975); *G. oculifera* (Cagle, 1953a; Dundee and Rossman, 1989); *G. ouachitensis* (Cagle, 1953b; Vogt, 1981, 1993); *G. pseudogeographica* (Vogt, 1981, 1993); *G. pulchra* (Cagle, 1952; Mount, 1975; Shealey, 1976; Lovich and McCoy, 1992); *G. versa* (Smith and Sanders, 1952; Haynes and McKown, 1974; Vogt, 1993). Skull and skeletal characters are described by McDowell (1964), Ernst and Barbour (1972), Gaffney (1979), and Dobie (1981); and karyotypes by McKown (1972), Stock (1972), and Killebrew (1977).

• **Distribution.** The genus *Graptemys* is found in temperate North America from southwestern Quebec and southern Ontario, including Lake George and Lake Champlain, westward through the Great Lakes and Mississippi drainages to the upper Missouri River in North Dakota. Populations occur throughout the Mississippi Basin, westward to west-central Texas (Brazos River), and eastward to extreme southwestern Virginia (Tennessee River drainage). Species of *Graptemys* also occur in Gulf Coast drainages from the Florida Panhandle to Louisiana, including the Apalachicola Bay drainage, Escambia Bay drainage, Mobile Bay drainage, Pascagoula River system, and the Pearl River. West of the Mississippi Embayment along the Gulf Coast, *Graptemys* species occur in the Colorado River (Texas) and the Guadalupe-San Antonio River system. Isolated populations occur in the Susquehanna River drainage in Pennsylvania and Maryland, in the Delaware River from its mouth to Sussex County, New Jersey, and in the lower Hudson River, New York. Species distributions are mapped in Iverson (1992).

• **Fossil Record.** All known fossil *Graptemys* have been referred to Recent species, and most are from sites within the modern range of the genus. Jackson (1975), however, described fossil *Graptemys barbouri* from a site (Pleistocene, Rancholabrean) on the Santa Fe River, Gilchrist County, Florida, 200 km east of the present range of the species. Fossil *Graptemys geographica* have been found in Pleistocene deposits in Texas, Kansas, Tennessee, and Virginia (Preston, 1979; McCoy and Vogt, 1990). Fossil *G. pseudogeographica* have been reported from Pleistocene sites in Michigan (Wilson and Zug, 1966), Kansas (Preston, 1979), and Texas (Preston, 1979; Slaughter et al., 1962; Stovall and McAnulty, 1950). The Michigan material may actually be *G. geographica* rather than *G. pseudogeographica* (Holman, 1988).

• **Pertinent Literature.** Most of the pertinent literature on the genus was reviewed in the species accounts. A recent general review, with species descriptions, key, and illustrations was that of Ernst and Barbour (1989). Recent taxonomic reviews are Lovich and McCoy (1992, *G. pulchra* group) and Vogt (1993, *G. pseudogeographica* group). Avise et al. (1992) and Lamb et al. (1994) reported on mitochondrial DNA in *Graptemys*. Iverson (1992) provided a distributional review with range maps for all species. A hypothesis for phylogenetic position of the genus was provided by Seidel and Jackson (1990) and a preliminary phylogeny for the species was presented by Iverson (1992).

• **Key to Species.** The Catalogue account numbers (when available) are given in parentheses after the species name.

1. a. Vertebral keel low, without prominent spines or knobs .. 2
   b. Vertebral keel with prominent spines or knobs 3

2. a. Horizontal J-shaped postorbital spot; carapace scutes convex; maximum CL 183 mm ..... *G. versa* (280)
   b. Postorbital spot oval or triangular; carapace scutes smooth; maximum CL 273 mm ..... *G. geographica* (484)

3. a. Vertebral keel with blunt, rounded black knobs ..... *G. nigrinoda* (396)
   b. Vertebral keel without blunt, rounded black knobs 4

4. a. Circular yellow or orange blotch on each pleural scute ... *G. flavimaculata* (403)
   b. Pleural scute marks not solid circular blotches 5

5. a. Pleural scutes with yellow-orange rings ..... *G. oculifera* (422)
   b. Pleural scutes without yellow-orange ring markings 6

6. a. Interorbital blotch present 7
   b. Interorbital blotch absent 10

7. a. Interorbital and postorbital blotches fused, with a central dark heart-shaped figure; chin with transverse light bar, rostrum blunt ..... *G. barbouri* (421)
   b. Interorbital and postorbital blotches fused or separate; chin with longitudinal light stripe; rostrum pointed 8

8. a. Interorbital blotch not connected to postorbital blotches; nasal trident well-developed ..... *G. ernsti* (585)
   b. Interorbital and postorbital blotches connected; nasal trident present or absent 9

9. a. Nasal trident usually present; single wide yellow bar (16-20% scute width) on upper side of each marginal scute .. *G. gibbonsi* (586)
   b. Nasal trident usually absent; narrow concentric yellow ocelli on marginal scutes ..... *G. pulchra* (360, part)

10. a. Chin with alternating transverse cream and dark green bars 11
    b. Chin without transverse cream and dark green bars ... 12

11. a. Postorbital blotch chevron-shaped, usually connected to suborbital spot to form a crescent ..... *G. caglei* (184)
    b. Postorbital blotch reduced to a spot that is encircled with one or more narrow rings and never connected to suborbital spot to form a crescent ..... *G. ouachitensis sabinensis*

12. a. Postorbital blotch narrow or a narrow crescent; up to 6 lines entering orbit; no large spots on lower jaw 13
    b. Postorbital blotch wide, or connected to subocular spot to form wide crescent; four large spots on lower jaw (mandibles, symphysis, throat) . *G. ouachitensis ouachitensis*

13. a. Postorbital blotch usually connected to subocular spot to form crescent, or no more than 3 lines entering orbit ..... *G. pseudogeographica kohnii*
    b. Postorbital blotch never connected to subocular spot; usually 3 or more (1-6) lines entering orbit ..... *G. pseudogeographica pseudogeographica*

• **Etymology.** The generic name *Graptemys* is derived from the Greek *graptos*, meaning inscribed or painted, and the Greek *emydos*, a freshwater turtle, in allusion to the often striking and complex color pattern of the carapace found in many species. The gender is feminine.

• **Comment.** The original concept of the genus *Graptemys* (Agassiz, 1857), as distinct from *Malaclemys*, was not immediately accepted. Neither Cope (1875) nor Boulenger (1889), in their influential catalogues, recognized *Graptemys* and the name *Malaclemys* (or *Malacoclemmys*, an invalid emendation) was generally used for species of *Graptemys* through the end of the 19th century. The type-species of *Graptemys* (*Testudo geographica* Le Sueur, 1817) was designated by Brown (1908), and the current concept of the genus was reestablished by Stejneger and Barbour (1917). That checklist set the pattern for the subsequent 47 years, until McDowell (1964) again proposed uniting *Graptemys* and *Malaclemys*. McDowell's proposal has not been widely accepted, notwithstanding that his arrangement has yet to be subjected to rigorous analysis. However concensus, supported by fragmentary evidence such as that supplied by McKown (1972), Wood (1977), and Dobie (1981), maintains that the two genera, however closely related, are on separate evolutionary trajectories.

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C.J. McCoy (deceased), Carnegie Museum of Natural History, Pittsburgh, PA 15213 U.S.A., and **Richard C. Vogt**, Estación de Biología "Los Tuxtlas," UNAM, Apartado Postal 94, San Andrés Tuxtla, Veracruz, México C.P. 95700.

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